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UPSC ENGINEERING SERVICES EXAMINATION



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### **ESE-2016 : Civil Engineering Topicwise Objective Solved Paper-I (1995-2015)**

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## Director's Message

Engineers and scientists from several disciplines have been involved in shaping the revolutionary growth of technology in India. During the last few decades of engineering academics, India has witnessed geometric growth in engineering pass-out candidates. It is noticeable that the level of engineering knowledge has degraded gradually, while on the other hand competition has increased in each competitive examination including GATE and UPSC examinations. Under such scenario high level efforts are required to take an edge over other competitors.



**B. Singh** (Ex. IES)

The objective of MADE EASY books is to introduce a simplified approach to the overall concepts of related stream in a single book with specific presentation. The topic-wise presentation will help the readers to study & practice the concepts and questions simultaneously, which is very useful for Freshers.

The efforts have been made to provide close and illustrative solutions in lucid style to facilitate understanding and quick tricks are introduced to save time.

*Following tips during the study may increase efficiency and may help in order to achieve success.*

- Thorough coverage of syllabus of all subjects
- Adopting right source of knowledge, i.e. standard reading text materials
- Develop speed and accuracy in solving questions
- Balanced preparation of technical and non-technical subjects with focus on key subjects
- Practice online and offline modes of tests
- Appear on self assessment tests
- Good examination management
- Maintain self motivation
- Avoid jumbo and vague approach, which is time consuming in solving the questions
- Good planning and time management of daily routine
- Group study and discussions on a regular basis
- Extra emphasis on solving the questions
- Self introspection to find your weaknesses and strengths
- Study the exam pattern to understand the level of questions
- Apply shortcuts and learn standard results and formulae to save time

**B. Singh** (Ex. IES)

CMD, MADE EASY Group

# CIVIL ENGINEERING

## Objective Solved Paper-I

UPSC Engineering Services Examination

Sl.	Topic	Pages
1.	Building Materials.....	1-76
2.	Solid Mechanics .....	77-221
3.	Structural Analysis.....	222-305
4.	Design of Steel Structures.....	306-400
5.	Design of Concrete and Masonry Structures .....	401-484
6.	Construction Practice, Planning & Management.....	485-562

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# I

## UNIT

# Building Materials

### Syllabus

**Timber :** Different types and species of structural timber, density-moisture relationship, strength in different directions, defects, influence of defects on permissible stress, preservation, dry and wet rots, codal provisions for design, Plywood.

**Bricks :** Types, Indian Standard classification, absorption, saturation factor, strength in masonry, influence of mortar strength on masonry strength.

**Cement :** Compounds of cement, different types, setting times, strength.

Cement Mortar : Ingredients, proportions, water demand, mortars for plastering and masonry.

**Concrete :** Importance of W/C Ratio, Strength, ingredients including admixtures, workability, testing for strength, elasticity, non-destructive testing, mix design methods.

### Contents

Sl.	Topic	Page No.
1.	Cement .....	2
2.	Mortar .....	14
3.	Lime .....	19
4.	Concrete .....	21
5.	Stones, Bricks and Bricks Masonry .....	47
6.	Timber .....	60
7.	Oil, Varnishes Paint, Distempers & Miscellaneous .....	74

- 1.1 Match **List-I** with **List-II** and select the correct answer using the codes given below the lists:

**List-I**

- A. Fineness of cement
- B. Setting time
- C. Soundness
- D. Workability

**List-II**

- 1. Le-Chatelier apparatus
- 2. Vicat's needle
- 3. Air permeability apparatus
- 4. Slump cone

**Codes:**

	A	B	C	D
(a)	1	2	3	4
(b)	3	1	4	2
(c)	3	2	1	4
(d)	1	4	3	2

[ESE : 1995]

- 1.2 If 'p' is the standard consistency of cement, the amount of water used in conducting the initial setting time test on cement is
- (a) 0.65p
  - (b) 0.85p
  - (c) 0.6p
  - (d) 0.8p

[ESE : 1995]

- 1.3 **Assertion (A):** Pozzolana is added to cement to increase early strength.

**Reason (R):** It offers greater resistance to the attack of aggressive waters.

- (a) both A and R are true and R is the correct explanation of A
- (b) both A and R are true but R is not a correct explanation of A
- (c) A is true but R is false
- (d) A is false but R is true

[ESE : 1995]

- 1.4 For complete hydration of cement the water-cement ratio needed is

- (a) less than 0.25
- (b) more than 0.25 but less than 0.35
- (c) more than 0.35 but less than 0.45
- (d) more than 0.45 but less than 0.60

[ESE : 1996]

- 1.5 Match **List-I** (Type of cement) with **List-II** (Characteristics) and select the correct answer using the codes given below the lists:

**List-I**

- A. Air entraining portland cement
- B. Low-heat portland cement
- C. Hydrophobic portland cement
- D. Rapid hardening portland cement

**List-II**

- 1. Suitable for very large structures
- 2. Unsuitable for very large masses of concrete
- 3. Greater resistance to frost attack
- 4. Safe storage under unfavourable conditions of humidity

**Codes:**

	A	B	C	D
(a)	4	2	1	3
(b)	3	4	1	2
(c)	3	1	4	2
(d)	4	1	2	3

[ESE : 1996]

- 1.6 While concreting in cold weather where frosting is also likely, one uses

- (a) high quality portland cement with minimum additives
- (b) high alumina cement with calcium chloride additives
- (c) portland cement together with calcium chloride additives
- (d) a mixture of high alumina cement and portland cement

[ESE : 1996]

- 1.7 Gypsum is used as an admixture in cement grouts for

- (a) accelerating the setting time
- (b) retarding the setting time
- (c) increasing the plasticity
- (d) reducing the grout shrinkage

[ESE : 1996]

**1.8** Which of the following pairs in respect of Ordinary Portland Cement (OPC) are correctly matched?

- 1. Initial setting time ... 30 minutes
- 2. Final setting time ... 10 hours
- 3. Normal consistency ... 10%

Select the correct answer using the codes given below:

- (a) 1, 2 and 3                      (b) 2 and 3
- (c) 1 and 2                        (d) 1 and 3

[ESE : 1997]

**1.9** High alumina cement is produced by fusing together a mixture of

- (a) limestone and bauxite
- (b) limestone, bauxite and gypsum
- (c) limestone, gypsum and clay
- (d) limestone, gypsum, bauxite, clay and chalk

[ESE : 1997]

**1.10** Consider the following statements:

High early strength of cement is obtained as a result of

- 1. fine grinding
- 2. decreasing the lime content
- 3. burning at higher temperatures
- 4. increasing the quantity of gypsum

Which of these statements are correct?

- (a) 1 and 2                      (b) 1 and 3
- (c) 2, 3 and 4                (d) 1, 3 and 4

[ESE : 1997]

**1.11** Before testing setting time of cement one should test for

- (a) soundness                      (b) strength
- (c) fineness                        (d) consistency

[ESE : 1998]

**1.12** Consider the following statements:

- 1. Tests on cement paste to determine initial and final setting times are done at normal consistency condition.
- 2. Low heat cement has a high percentage of tricalcium aluminate.
- 3. High early strength portland cement contains a larger percentage of tricalcium silicate and a lower percentage of dicalcium silicate.

Which of these statements are correct?

- (a) 1 and 2                      (b) 1 and 3
- (c) 2 and 3                      (d) 1, 2 and 3

[ESE : 1999]

**1.13** Match **List-I** (Property of cement) with **List-II** (Testing apparatus) and select the correct answer using the codes given below the lists:

**List-I**

- A. Specific gravity
- B. Setting time
- C. Soundness
- D. Fineness

**List-II**

- 1. Blain's apparatus
- 2. Le Chatelier's flask
- 3. Compressometer
- 4. Autoclave
- 5. Vicat's apparatus

**Codes:**

	A	B	C	D
(a)	3	5	1	2
(b)	2	5	1	4
(c)	2	5	4	1
(d)	5	3	4	1

[ESE : 1999]

**1.14** The role of superplasticizer in a cement paste is to

- (a) disperse the particles
- (b) disperse the particles and to remove air bubbles
- (c) disperse the particles, remove air bubbles and to retard setting
- (d) retard setting

[ESE : 1999]

**1.15** Consider the following oxides:

- 1.  $\text{Al}_2\text{O}_3$                       2.  $\text{CaO}$                       3.  $\text{SiO}_2$

The correct sequence in increasing order of their percentage in an ordinary portland cement is

- (a) 2, 1, 3                      (b) 1, 3, 2
- (c) 3, 1, 2                      (d) 1, 2, 3

[ESE : 1999]

**1.16** Increase in fineness of cement

- (a) reduces the rate of strength development and leads to higher shrinkage
- (b) increases the rate of strength development and reduces the rate of deterioration